MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

ECP2056 – DATA COMMUNICATIONS AND COMPUTER NETWORKING
(RE/TE)

15 MARCH 2019
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTION TO STUDENTS

1. This Question paper consists of 4 pages including cover page with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Describe **five** components of a data communication system. Provide a sketch for the system.

[10 + 4 marks]

(b) The Open System Interconnection (OSI) model defines a networking framework to implement protocols in seven layers.
   (i) List the **seven (7)** layers of OSI model.

[7 marks]

   (ii) Match the following with one of the layers from OSI model:
   - Reliable end-to-end data transportation
   - Transmission of bit stream across physical medium
   - Route determination
   - Log-in and log-out procedures.

[4 marks]

Question 2

(a) What is the difference between asynchronous and synchronous transmission? What is the major disadvantage of asynchronous transmission?

[4 + 4 marks]

(b) Consider an audio signal with spectral components in the range of 200 to 4,000 Hz. Assume that a sampling rate of 8,000 samples per second will be used to generate a PCM (Pulse Code Modulation) signal. Find:
   (i) Number of quantization levels when SNR = 30 dB.

[5 marks]

   (ii) Data rate.

[2 marks]

(c) Time-division multiplexing (TDM) is a method of putting multiple data streams in a single signal by separating the signal into many segments, each having a very short duration.
   (i) What is the difference between synchronous TDM and statistical TDM?

[2 marks]

   (ii) Figure Q2.1 shows a character-interleaved synchronous TDM system. Sketch the output frames and their corresponding contents based on the input given.
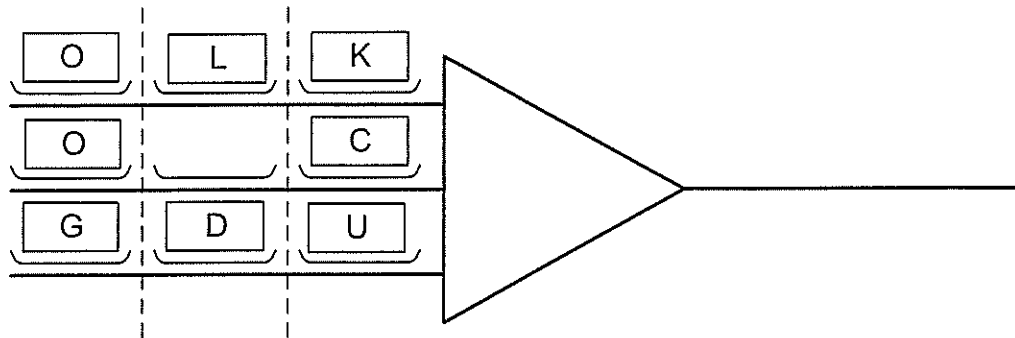
[8 marks]

Continued...

Figure Q2.1

Question 3

(a) State the property that Huffman coding exploits on the relative frequency of occurrence of each transmitted symbol.

[5 marks]

(b) ALOHA is the earliest random access method. A network with ALOHA protocol transmits 400-bit frames on a shared channel of 400 kbps. The system produces 500 frames per second.

(i) Determine the throughput in terms of surviving frames for a pure ALOHA protocol.

[5 marks]

(ii) Determine the throughput in terms of surviving frames for a slotted ALOHA protocol.

[5 marks]

(iii) Based on calculation for (i) and (ii), which protocol would give a better performance?

[2 marks]

(c) A station which is using Stop-and-Wait ARQ protocol has an 80% link utilization and a 3 ms propagation delay. Assuming the propagation speed is 2×10^8 m/s. Determine:

(i) Transmission time.

[4 marks]

(ii) The length between the two stations.

[4 marks]

Continued...

Question 4

(a) Internet Protocol (IP) refers to network layer that responsible for host-to-host delivery and routing the packets through the routers or switches. Figure Q4.1 shows an internetwork which is made of four LANs and one WAN. Computer A needs to send a data packet to Computer D. Briefly describe the functionality of the network layer at the source, at a switch/router, and at the destination.
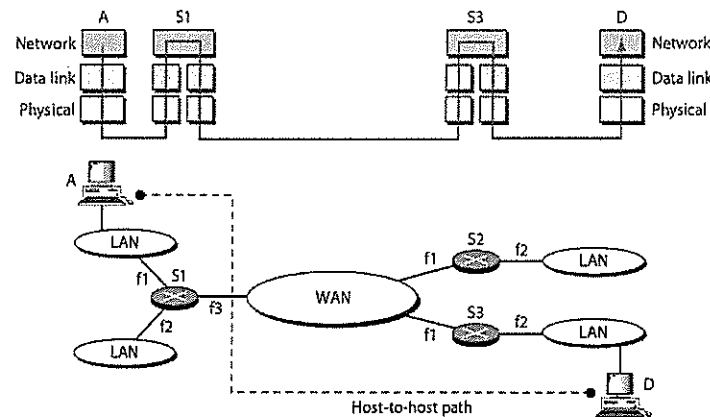

Figure Q4.1

[12 marks]

(b) An 850-octet transport layer datagram is to be transmitted and is needed to be fragmented because it will pass through a network adopting IP with a maximum packet size of 200 octets which includes a header of 20 octets at the network layer. Show the Total Length, Fragment Offset and More Fragments Flag values in each of the resulting fragments in tabular form.

[13 marks]

End of Paper